



## DETERMINATION OF MINORITY CARRIER DIFFUSION LENGTH IN SOLID STATE MATERIALS

### FIELD OF INVENTION

5 This invention relates to determining the diffusion length in solid state materials.

### BACKGROUND OF THE INVENTION

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The purity of the silicon wafers depends upon the concentration of different impurities, including heavy metal contaminates (e.g., Fe, Cr, Cu), introduced during the manufacturing and processing of semiconductor devices. The minority carrier lifetime and the diffusion length are used for contamination monitoring in silicon wafers. The challenge is to measure diffusion length, and monitor contamination in the product wafers, at all steps in the processing and manufacturing of integrated circuits.

15 In current techniques, the intensity-modulated light, with the photon energy larger than the band gap, is directed to the front side of semiconductor. As a result of photo generation, the excess carriers change the surface potential of the semiconductor, and alternative surface photo voltage (SPV) is measured using a transparent conducting electrode placed near the front surface of the silicon wafer, within the illumination area. Diffusion length is determined by measurements of the SPV signals and light fluxes under successive illuminations of the wafer with monochromatic light at different wavelengths.

20 The American Society for Testing and Materials (ASTM) recommends two methods, F 391 A and B, for SPV measurement of the diffusion length. The calculation of the diffusion length is based upon the solution of the one-dimensional diffusion